

# Emission Inventory for Shore Power



September 24, 2007  
Sacramento, CA



## Overview

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- ♦ Activity Data
- ♦ Emissions Calculation
- ♦ Auxiliary Engine Emissions
- ♦ Boiler Emissions
- ♦ Growth
- ♦ Results
- ♦ Next Steps

## Activity Data

- ♦ State Lands Commission: default activity
  - Arrival port, arrival date, prev/next port, vessel name/type
  - 10,514 port calls in 2006
- ♦ Wharfinger data
  - Arrival port, berth number, time at dock
  - Reconciled with State Lands

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## Emissions Calculation

Emissions =

Engine Power \* Time \* Load Factor\* Emission Factor

- ♦ Auxiliary Engine Power
- ♦ Hotelling/Anchorage Time
- ♦ Load Factors
- ♦ Emission factor

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## Auxiliary Engine Power

- ♦ Auxiliary Engine Power
  - Limited data from Lloyds
  - Starcrest Appendices POLA/POLB/POSD
  - Environ – Port of Oakland
- ♦ 2005/2007 OGV Surveys

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## Hotelling Time

- ♦ ~95% are based on Wharfinger data
- ♦ Add together berth shifts
- ♦ If missing:
  - Average by vessel type by port

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## Statewide Average Hotelling Time

Vessel Type	Hours at Berth
C1000	24
C2000	33
C3000	32
C4000	33
C5000	49
C6000	51
C7000	52
C8000	66
Cruise	12
Reefer	59

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## Hotelling Load Factors

- ◆ Based on 2005 OGV Survey

Vessel Type	Load Factor
C1000	18%
C2000	22%
C3000	22%
C4000	22%
C5000	18%
C6000	15%
C7000	15%
C8000	18%
Cruise	16%
Reefer	32%

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## Emission Factors – gm/kw-hr

- Auxiliary Engine Only
- Sources:
  - Entec/European Union
  - ARB for PM

Pollutant	HFO	Distillate
NOx	14.7	13.9
PM10	1.5	0.3
CO2	722	690

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## Growth

- ♦ Revised Growth factors
- ♦ Based on ACE Entrances/Clearance 1994-2005
- ♦ Net Registered Tonnage of Ships
  - Matches installed power, more data available

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## Growth from 2006: Container

	2006	2014	2020	2025
CA Total	1.0	1.7	2.4	3.3
LA/LB	1.0	1.7	2.5	3.5
Oakland	1.0	1.6	2.2	2.9

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## Growth from 2006: Passenger

	2006	2014	2020	2025
CA Total	1.0	1.5	2.1	2.8
LA/LB	1.0	1.4	1.7	2.1
San Diego	1.0	1.5	2.0	2.6
SF	1.0	1.8	2.7	3.8
Hueneme	1.0	2.0	3.2	4.9

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## Growth from 2006: Reefer Vessel

	2006	2014	2020	2025
CA Total	1.0	0.8	0.7	0.6
LA/LB	1.0	0.5	0.3	0.2
San Diego	1.0	2.0	3.5	5.4
Hueneme	1.0	1.1	1.3	1.4

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## Statewide Emissions 2006 Base Year

Auxiliary engine hotelling emissions for  
shore power regulation ports only

	<b>NOx</b>	<b>PM10</b>	<b>CO2</b>
Container	13.79	1.12	679.52
Cruise	2.45	0.24	120.28
Reefer	0.85	0.07	42.11

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## Next Steps

- ♦ Schedule
  - Cold Ironing Regulation, Dec. 2007
  - Main Engine Reg., April 2008
  - Vessel Speed Reduction, 2008
- ♦ Inventory is still being evaluated
  - QA is on-going
- ♦ District/Port/Stakeholder Outreach
- ♦ Comments/Questions

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## For More Information

- ♦ Contact
  - Andy Alexis
  - California Air Resources Board
  - (916)323-1085
  - [aalexis@arb.ca.gov](mailto:aalexis@arb.ca.gov)

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